Certificate No: LR2269070REP
Issue Date: 24/01/2022
Expiry Date: 23/01/2025

Repair Certificate

Manufacturer	**Metalock Engineering Germany GmbH**
Address	Gutenbergring 64, Norderstedt, 22848, Germany
Approval	Machining & Heat Treatment
Scope of Approval	**"In-Situ" Annealing and Re-Machining of Crankshafts** This company has been approved in accordance with the requirements of Lloyd's Register for the in-situ annealing and re-machining of crankshafts installed in marine diesel engines. Previous Lloyd's Register reference No. REP 0070.
Applicability	Before any repair is undertaken, Lloyd's Register is to be informed and their agreement obtained. All repair procedures including NDE to be submitted to Lloyd's Register. The annealing process described in the Metalock Enginnering work procedure "Heat-treatment process description" has been developed to reduce the hardness of damaged/heat affected crankpins. Before heat treatment is undertaken the material specification, ideally including the tempering process, must be known so as to ensure the annealing temperature used does not exceed that of the original tempering. After annealing the surface hardness of the annealed area must be within the range given by the original engine manufacturer. Machining, in accordance with Metalock Engineering process description "Machining of crankpins" dated 03.07.2013, is to result in satisfactory surface finish within original engine manufacturer tolerances. Final inspection to

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APPROVED

Clive Arnold

Lead Metallurgist: Metallurgical Assurance to Lloyd's Register EMEA
A member of the Lloyd's Register group

71 Fenchurch Street, London, EC3M 4BS, United Kingdom

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include the following: magnetic particle inspection, surface hardness, dimension, run-out, surface finish and crank web deflection.

This approval is subject to compliance with the requirements of Lloyd's Register. Each repair must be undertaken to a written repair procedure that has been accepted by the attending Surveyor. All work is to be completed by fully trained and authorised personnel to the Surveyor's satisfaction.

Limitations Application is limited to one piece forged crankshafts made of tempering steel that have not been surface hardened by induction hardening or nitriding.

This certificate is issued to the above manufacturer and is valid until the specified expiry date.

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